

At the Crossroads of Technology and Policy



The Center for Global Security Research brings together policymakers and scientists to enhance national and world security.

WHEN Attorney General Janet Reno announced the establishment last February of a new FBI center to investigate and prevent attacks on the nation's critical infrastructure, she did not appear at Department of Justice headquarters in Washington, D.C. Instead, she chose to make her announcement at a Lawrence Livermore workshop co-sponsored by a small organization that is attracting increasing attention from top scientists and government policymakers worldwide.

That organization is Livermore's Center for Global Security Research (CGSR), established in 1996 to bring the

technology and policy communities closer together. Its goal is to reduce threats to international security, especially those associated with weapons of mass destruction, by sponsoring workshops, research fellows, and independent analyses to study important national and world security issues involving policy and technology.

CGSR Director Ron Lehman says the Center's "product" is fresh insight into some of the most vexing national security issues. Lehman notes that the Center is not afraid of getting into sensitive areas, but he emphasizes the need for fellows and participants to be



fiercely independent in their work, intellectually rigorous, and dedicated to hearing from an uncommonly broad range of viewpoints and backgrounds.

February's critical infrastructure workshop, for example, co-sponsored by Stanford University's Center for International Security and Arms Control, brought together a wide range of representatives from business, government, and technology (see box, pp. 14–15). They addressed ways to protect the nation's banking, communication, computer, and power networks from a host of potential adversaries, ranging from state-sponsored foreign terrorists to youthful hackers.

The workshop was but one illustration of CGSR's practice of joining Livermore scientists and engineers with other technical experts, academics, policymakers, military leaders, and industry executives to address issues involving national security technology and policy. Past workshop topics have included chemical and biological weapons terrorism, nuclear materials smuggling, relations with Russian nuclear

scientists, the future of nuclear forces, and environmental security.

Small Is Good

The CGSR is deliberately small; there are no permanent employees other than administrator Karen Kimball. Lehman and half-time special assistant Eileen Vergino, a seismologist, are on rotation while retaining other responsibilities at Livermore. The Center invites Livermore specialists and outside scientists to work together on specific tasks for a limited time, publish their findings, and then return to their main activities. "I think of us as a think tank constantly reorganizing itself as it takes on new tasks," Lehman says.

Lehman is the first to point out that the nation has no shortage of think tanks and national security study centers. The uniqueness of CGSR, however, derives from its close affiliation with Lawrence Livermore, one of the few U.S. institutions with expertise in all phases of nuclear weapons development. Lehman cites Livermore's strengths in analysis, modeling, and computer simulation as important resources that are regularly tapped for CGSR-

sponsored research. The [table on p. 12](#) summarizes the Center's multidisciplinary support from all Laboratory directorates.

While Lehman reports to Livermore Director Bruce Tarter, the CGSR is part of the Nonproliferation, Arms Control, and International Security (NAI) Directorate. The Center's activities complement the diverse efforts of NAI specialists to prevent the proliferation of weapons of mass destruction, assist in arms control matters, and build stronger relations with scientists of the newly independent states of the former Soviet Union.

As CGSR director, Lehman relies regularly on his diplomatic experience with and knowledge of arms control issues. Before joining Lawrence Livermore in 1993, he served as director of the U.S. Arms Control and Disarmament Agency, Assistant Secretary of Defense for International Security Policy, Deputy Assistant to the President for National Security Affairs, and U.S. Chief Negotiator for the Strategic Arms Reduction Treaty I.

Lehman also chairs the governing board of the International Science and

The critical infrastructure workshop at Lawrence Livermore in February 1998 featured a panel discussion on ways to protect the nation's critical banking, communications, computer, and power networks from a variety of terrorist attacks. Panelists were (left to right): George Spix of Microsoft; Scott Penberthy from IBM; Tom Marsh, chairman of the Commission on Critical Infrastructure Protection; former Secretary of Defense William Perry; Philip Bobbitt from the National Security Council; David Cooper, Lawrence Livermore's Associate Director for Computation and Chief Information Officer; Ron Lee, Department of Justice; and Anita Jones, a professor at the University of Virginia. (Above) Former Defense Secretary Perry makes a point during the panel discussion.



Ron Lehman, Director of the Center for Global Security Research, works with administrator Karen Kimball (right) and scientist Eileen Vergino to plan one of the Center's diverse national security activities.

Technology Center (ISTC). Established in 1994 and headquartered in Moscow, the ISTC is funded by several Western countries. It is working to prevent the dispersion of knowledge related to weapons of mass destruction by financing nonweapons projects that integrate weapons specialists from the newly independent states of the former Soviet Union into the international scientific community. Both Lehman and Vergino, a scientific advisor to the ISTC, travel regularly to Moscow for ISTC meetings. (For more on the ISTC, see the [September 1997 S&TR](#), pp. 19–20.)

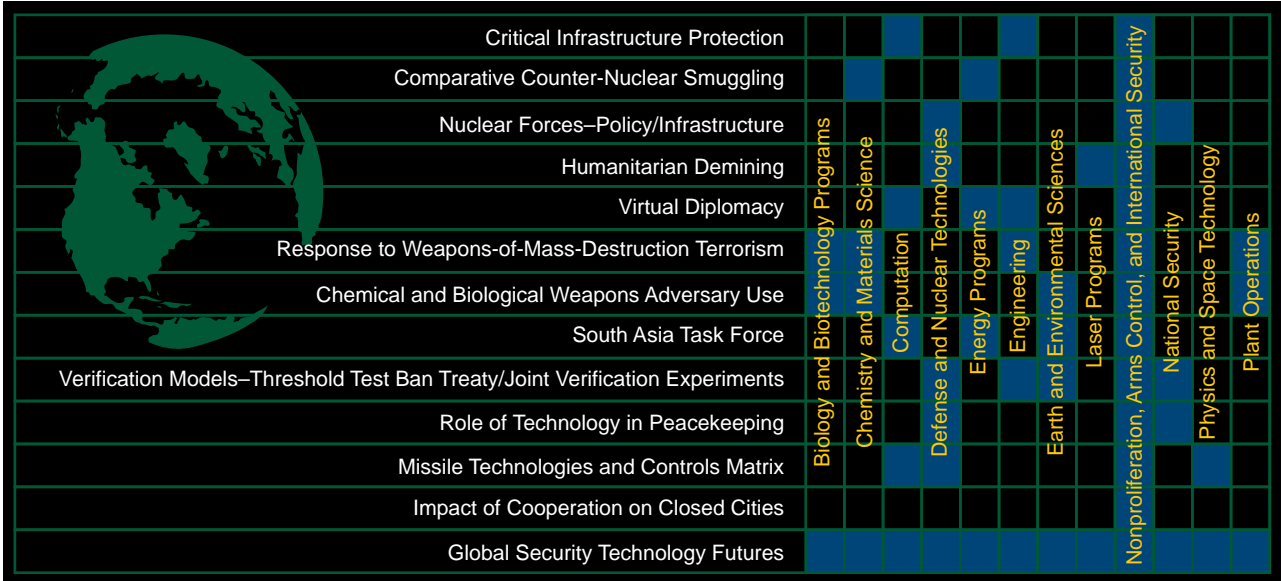
An International Perspective

The CGSR’s international viewpoint is evident in its workshops, such as a seismic forum held last year involving Jordanian and Israeli scientists. Indeed, the Center’s inaugural conference, “Meeting the Challenges of International Peace Operations: Assessing the Contributions of Technology,” established a precedent when it attracted United Nations field commanders from around the globe to Livermore.

Former NAI Associate Director Bob Andrews led the effort to create the CGSR. At its inauguration, Andrews said, “Although the Laboratory has been a key player in providing technology support to U.S. and international agencies, we have not been as well connected to the policy community as we might. . . . Even the most clever and sophisticated technology must be assessed in terms of the overall policy framework, including options that it may or may not make available.”

Those associated with CGSR activities hail its value as an educational and networking resource for both Livermore scientists and national policymakers. “We want to bridge the gap between the technology and policy communities,” Lehman explains.

Livermore physicist Don Prosnitz, chief NAI scientist, is involving more NAI employees in CGSR activities because the interchange between technologists and policymakers is so valuable. “We want to get technologists into policy forums so that they understand the policy influences of the technology they’re developing. We also



The Center for Global Security Research taps into expertise from across the Laboratory.

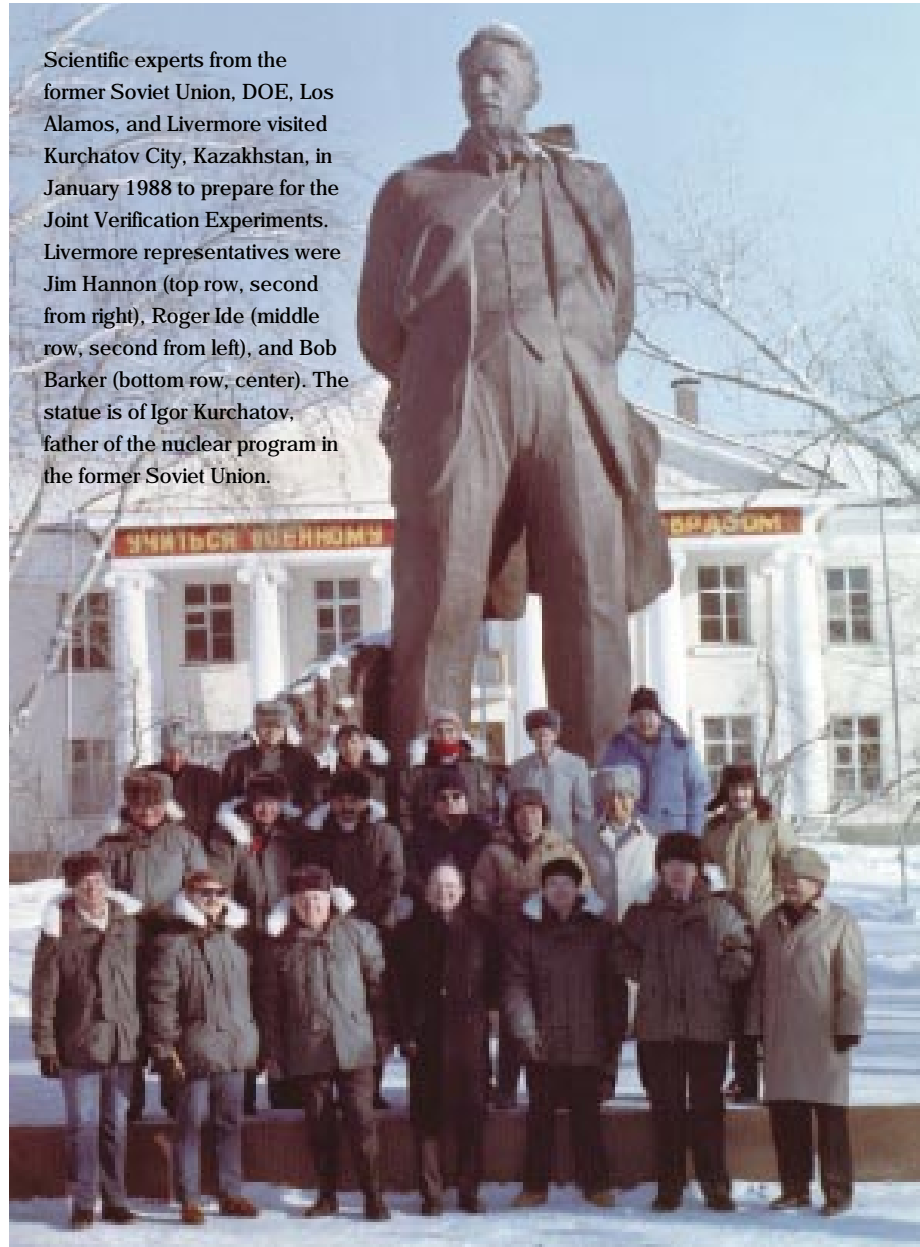
want to expose policy types to technologists so that they understand the limitations of technology.”

Lehman notes that having an international perspective encourages examination of the cross-cultural aspects of security issues—with often surprising results. A 1997 workshop on protecting fissile materials, co-hosted by CGSR, Stanford University’s Center for International Security and Arms Control, and the Monterey Institute of International Studies, revealed striking cultural differences. After workshop participants heard some experts explain the need for shock troops and air defenses to protect fissile-material storage centers, a Japanese representative noted that in his country, armed guards had long been disdained because once someone in Japan trusts another, it is considered very impolite (and a violation of that trust) to verify. Meanwhile, a South Asian speaker cited a similar cultural problem when guards of one social class must, as a part of their jobs, search the briefcases of scientists and officials of higher social classes.

Livermore chemist Jeff Richardson, principal deputy program leader in NAI, helped organize two workshops on fissile materials smuggling with the U.S. Air Force Institute for National Security Studies. Characteristic of CGSR activities, attendees represented major federal agencies, U.S. study centers, and representatives from France, Poland, Kazakhstan, Russia, the London Metropolitan Police, and even the Public Broadcasting System. “The Center provides the right forum for these kinds of interchanges,” says Richardson. “It is an excellent opportunity to facilitate interactions on a global scale.”

Case Study of the TTBT

This year, the CGSR began a case study in verification methodology by reviewing the events leading to the signing of the Threshold Test Ban Treaty



Scientific experts from the former Soviet Union, DOE, Los Alamos, and Livermore visited Kurchatov City, Kazakhstan, in January 1988 to prepare for the Joint Verification Experiments. Livermore representatives were Jim Hannon (top row, second from right), Roger Ide (middle row, second from left), and Bob Barker (bottom row, center). The statue is of Igor Kurchatov, father of the nuclear program in the former Soviet Union.

(TTBT), which limited underground nuclear tests to 150 kilotons. Although negotiated in 1974, the treaty was ratified by the U.S. Senate in 1990 only after the establishment of a strict verification protocol with the Soviet Union. That protocol included the historic Joint Verification Experiments (JVE), whereby Soviet and U.S. teams for the first time

conducted on-site yield measurements at each other’s nuclear test sites.

“There is a tremendous richness of ideas and history associated with the TTBT,” says Lehman. “It seemed useful to do a case study and look at the evolution of our thinking regarding the treaty and the meaning of ‘adequate and effective’ verification.”

Vergino, who provided technical support to the U.S. delegates in Geneva during the treaty's protracted negotiations, is leading the study. She is being assisted by many of the principals involved in the treaty process, including specialists from Lawrence Livermore, Los Alamos National Laboratory, the Department of Energy, and the State Department.

"We believe our study may provide lessons for the future," says Vergino. "JVE was a turning point in Soviet relations with the West. Many American-Russian friendships were forged, and the more open atmosphere anticipated the post-Cold War era."

She also notes that Livermore played a leading role in organizing the "Lab-to-Lab" interactions with the Russian nuclear institutes in the formerly closed Russian cities during that time. That relationship has expanded to include the exchange of electronic mail between Russian schoolchildren living in those cities and Livermore children in a program Vergino helped establish. (For other details on the Lab-to-Lab program, see the *September 1997 S&TR*, pp. 18-19.)

Vergino is hopeful that the Center's TTBT study will be ready in time to share with Russian colleagues at a 10-year JVE jubilee celebration being

planned for this summer in Kazakhstan as well as at a technical exchange meeting also planned for this summer in Nevada. The CGSR is helping to coordinate American participation in the jubilee.

Another arms agreement receiving particular CGSR attention is the Convention on the Prohibition on the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction. Prosnitz has worked with the Center on three meetings devoted to various aspects of the treaty. "It's a very important treaty because it bans an entire class of

Preventing Attacks on the Nation's Critical Infrastructures

How vulnerable to cyber and physical attack are the nation's emergency services and telecommunications, electrical power, gas and oil storage, banking and finance, transportation, and water supply systems? In July 1996, President Clinton established the Commission on Critical Infrastructure Protection to assess the vulnerabilities and recommend ways of protecting these essential resources.

To examine many of the issues connected with the Commission's work, Lawrence Livermore's Center for Global Security Research (CGSR) and Stanford University's Center for International Security and Arms Control conducted two workshops at Stanford in March and July 1997. The workshops were attended by top-level representatives from government, industry, and academia. Participants also included Commission members and staff, who told CGSR Director Ron Lehman that they found the workshops invaluable in the preparation of their October 1997 final report.

Livermore senior engineer Stan Trost was instrumental in working with the two centers to sponsor the series. "If critical infrastructures like the Internet and phone system go down, the country is in trouble," says Trost. "We wanted a 'safe' place for participants, especially corporate and government representatives, to discuss their common concerns."

The Commission's final report identified significant vulnerabilities in the nation's critical infrastructures. It recommended an effort to educate the American public and industry; a broad program of cooperation and information sharing between government and industry; reconsideration of laws related to infrastructure protection; the strengthening of research and



Attorney General Janet Reno announces the formation of the National Infrastructure Protection Center during her visit to the Laboratory in late February 1998.

development; and the establishment of a national organization dedicated to all aspects of critical infrastructure protection.

Implementing Recommendations

According to Lehman, the present task is to determine the best ways to implement the commission's recommendations. That was the focus of the series' third workshop, held at Lawrence Livermore on February 26 and 27, 1998. Workshop participants included William J. Perry, former Secretary of Defense; Tom Marsh, Commission Chairman; Michael May, co-director of Stanford University's Center

weapons, but it has no teeth,” he says. One workshop focused on ways to strengthen inspection protocols with on-site biological sampling, while another explored ways for nations to cooperate if terrorists ever used biological weapons.

The CGSR invites Laboratory scientists—and those at other institutions—to apply for fellowships to pursue original research in one of four focus areas: management, control, and reduction of threats associated with weapons of mass destruction; security implications of emerging technologies such as biological and chemical weapons; threat anticipation and

management; and the future role of military forces. A review committee recommends proposals for funding.

“We want research topics that leverage the talents and resources at LLNL,” says Lehman. Visiting fellows are especially encouraged to seek broad interaction with Livermore employees. For example, Ken Weiss, formerly of the Arms Control and Disarmament Agency, is working with NAI specialists on issues concerning missile technology control. Previously, Jim Walsh from the Massachusetts Institute of Technology examined why fewer nations than originally predicted had acquired nuclear weapons.

Ridding the World of Mines

From within the Laboratory, physicist David Eimerl of the Laser Programs Directorate is doing a systems analysis of humanitarian demining as a half-time Center fellow. Recently, Eimerl chaired a CGSR-sponsored conference on technological solutions for clearing land mines. “There is a lack of coordination between the people who are on the front lines and those who are in labs developing the technologies. The workshop was a great way to get us educated.”

He notes that the technological requirements posed by demining are

for International Security and Arms Control; Bruce Tarter, Lawrence Livermore Director; David Cooper, Livermore Associate Director for Computation; and representatives from RAND Corp., the White House Office of Science and Technology Policy, Cisco Systems Inc., Microsoft, Stanford University, University of Virginia, Blue Shield, the National Security Council, DOE’s Office of Nonproliferation and National Security, the Department of Energy, the Department of Defense, SRI International, Sandia National Laboratories, U.S. Telephone Association, and others.

In her keynote address televised to Livermore employees, Reno warned that the nation’s critical infrastructures have become “more vulnerable than ever before as we come to rely on technology as never before.” As a result, she said, “I think this is the most extraordinarily challenging time that law enforcement has ever faced.”

Reno said some of today’s criminals “don’t have guns; they have computers, and they may have . . . weapons of mass destruction.” She said that to appreciate the dimensions of the problem, one only has to realize that “someone could sit in a kitchen in St. Petersburg, Russia, and steal from a bank in New York.”

She noted that the Livermore workshop could not be more timely because the Administration was, at that moment, engaged in determining how to implement the Commission’s report. She underscored the importance of the Commission’s recommendation of a broad national partnership to ensure the protection of critical networks and systems.

Partnerships Work

Such partnerships do work, Reno emphasized, pointing to a recent New York hacker case that teamed the FBI, the Secret

Service, Nynex, Southwest Bell, other private companies, and several universities to identify and prosecute individuals who had hacked into a telecommunications network, a credit reporting company, and other systems.

To promote partnerships and strengthen existing resources, Reno announced the establishment of the FBI’s National Infrastructure Protection Center to detect, prevent, and respond to cyber and physical attacks on the nation’s critical infrastructure. The new organization, she said, will include representatives from federal agencies and the intelligence community. She expressed hope that the private sector would be an active participant in the new center as well.

The Attorney General said the federal government must also work with scientists as partners “to develop technologies and processes that enable us to obtain evidence in strict adherence to the fundamental protections guaranteed our citizens by the Constitution.” She suggested that scientists may need to work together with Fourth Amendment (protection from unlawful search and seizure) experts.

In conclusion, Reno said her visit to Lawrence Livermore was “extraordinarily helpful” and had convinced her that “based on the example of what you do here, we can make a difference. . . . Thank you so very much for setting an example.”

Lehman is hopeful that Lawrence Livermore will play a significant role in helping to implement the Commission’s findings. For example, its expertise in computer simulation for computer security applications has drawn significant interest from workshop participants and Commission members.

particularly daunting. “Demining is not like prospecting for gold. If you find some gold, even if you don’t find all of it, you’re happy. But with demining, you have to find all the mines; you can’t miss a single mine. Doing anything 100% is an incredible challenge.”

Eimerl says that demining also involves fascinating policy issues and human, international, national, and political dimensions. After traveling to Bosnia, for example, he discovered that although the thousands of buried mines there pose a threat to the population, they also serve to keep borders intact and help to discourage an attack from neighboring rival factions. Despite the complexities of the demining problem, he believes that “Livermore, with its intellectual and technical smarts, is the right place to take on this issue, and the Center is the right place to look at the nexus of policy, technology, and security.”

Looking to the Future

“We want the work done at the Center to be valued and respected by the best minds and institutions around the world,” says Lehman. To accomplish that, he says, means reaching out more to University of California campuses and other academic institutions, as well as to industry, government, and international organizations.

The Center is also looking for ways to make its work more accessible. Lehman’s goal is to have all of the

research papers and workshop reports placed on the CGSR World Wide Web site (www.llnl.gov/nai/cgsr-home). He is also working with the University of California Institute on Global Conflict and Cooperation to use the Internet for electronic conferencing, part of a proposed “virtual diplomacy” initiative.

Lehman says the best measure of the Center’s success is the degree to which senior officials and top-ranking experts desire to be CGSR participants and fellows and the interest, inside Lawrence Livermore and out, in using the fresh insights from its studies and workshops. Judging by recent history, including Janet Reno’s keynote address

in February, the CGSR is meeting Lehman’s tough standards.

—Arnie Heller

Key Words: Center for Global Security Research (CGSR), Commission on Critical Infrastructure Protection, computer security, International Science and Technology Center (ISTC), Joint Verification Experiments (JVE), Lab-to-Lab program, land-mine removal, National Infrastructure Protection Center, nonproliferation, Threshold Test Ban Treaty (TTBT).

For further information contact

Ronald F. Lehman, Director, Center for Global Security Research, (925) 422-6141 (lehman3@llnl.gov).

About the Scientist



RONALD F. LEHMAN II is the Director of the Center for Global Security Research at Lawrence Livermore National Laboratory. He chairs the governing board of the International Science and Technology Center, an intergovernmental organization headquartered in Moscow, Russia. Lehman serves as Assistant to the Director of Lawrence Livermore and is a member of the Laboratory’s Institutional Review Board and Bio-Safety Board. He is a graduate of Claremont McKenna College (B.S., 1968) and earned his Ph.D. from Claremont Graduate School in 1975, the same year he went to Washington, D.C., as a fellow of the Hoover Institution at Stanford University to begin his long and substantive diplomatic career in international arms control, disarmament, and the nonproliferation of weapons of mass destruction. He has served three U.S. Presidents (Reagan, Bush, and Clinton), three Secretaries of State, three Secretaries of Defense, and three National Security Advisors in a variety of senior executive and advisory positions to promote peace through international disarmament and nonproliferation policymaking.